DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 22, 2009 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Nagano (Japan 01-287269).

Regarding claims 1, 13, Nagano et al. teach an apparatus and method comprising a first group of spaced apart cathode/target assemblies and a transportation unit for transporting at least one substrate/workpiece past each cathode/target assembly of the first group of cathode/target assemblies for deposition of a first plurality of sub-layers on a first surface of the at least one substrate/workpiece. The first group of cathode/target assemblies is adapted to provide said first plurality of sub-layers with different sputtered film thickness profiles, such that the first plurality of sub-layers

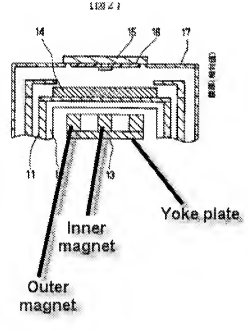
collectively form the uniform thickness layer of the selected material and wherein the first plurality of sub-layers have an inner diameter thickness that is different from an outer diameter thickness. The sum of curves (a)-(c) produce a uniform film. Curve (a) produces (a) center thick profile. Curve (b) produces an outer edge thick profile. (See Abstract; Fig. 1; Fig. 2)

Claims 1, 13, 24 and 27-32 are rejected under 35 U.S.C. 102(b) as being by Akiyama et al. (Japan 2000-057640) (Evidence document Brors (U.S. Pat. 4,169,031)).

Regarding claims 1, 13, 24, Akiyama et al. teach a cathode sputtering apparatus and process for forming a uniform thickness layer of a selected material on at least one workpiece in a multi-stage process comprising depositing a plurality of sub-layers. A first group of spaced-apart cathode target assemblies (i.e. chambers 2, 3) comprising annular-shaped magnetron magnet assemblies (i.e. magnet diameter of 160 mm and 200 mm). A transportation unit for transporting at least one workpiece past each target assembly of the first group of target assemblies for deposition of a first plurality of sub-layers on a first surface of the at least one workpiece. (i.e. conveyance device for inline processing) Each target assembly of the first group of target assemblies comprises a sputtering surface oriented substantially parallel to the first surface of the at least one substrate. The first group of target assemblies adapted to provide sublayers with different sputtered film thickness profiles, such that the first plurality of sub-layers collectively form the uniform thickness layer of the selected material (i.e. thickness distribution suppressed to 5%). The annular-shaped magnetron magnet assemblies having progressively increasing diameters. (See Abstract; Machine Translation 0020;

Machine Translation 0025; Machine Translation 0036) The size of the magnets are either decreased from largest to smallest or increased from smaller to largest. (Machine Translation 0025, 0036 respectively) As to the first plurality of sub-layers having an inner diameter thickness that is different from an outer diameter thickness the sub-layers inherently produced have the different thicknesses due to the relative size of the different magnets used to produce the sub-layers.

As to the shape of the magnets Akiyama teach in Fig. 2 an annular shaped magnetron assembly. From Figure 2 it appears that there is an outer ring shaped magnet and an inner magnet on a disk yoke. See annotated Figure 2 below.



Furthermore as evidenced by Brors an assembly for magnetron sputtering has a centrally disposed cylindrical permanent magnet 31 is centrally disposed coaxially of the outer permanent magnet 29. A disc shaped magnetic yoke 32 is disposed. (Column 3 lines 1-7; Figs. 1, 2)

Regarding claims 27-32, Akiyama et al. teach the outer diameter of the magnetron magnet to be 200 mm and 120 mm respectively. It would follow that the inner diameters would be less than 200 mm and less than 120 mm because of the showing in Fig. 2. (See Abstract; Fig. 2)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2-4, 6, 7, 11, 15-17, 20 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al. (Japan 2000-057640) (Evidence document to Brors U.S. Pat. 4,169,030) in view of Hedgcoth (U.S. Pat. 4,894,133).

Akiyama et al. is discussed above and all is as applies above. (See Akiyama et al. discussed above)

The differences not yet discussed is a second set of targets to coat a second side of the substrate is not discussed (Claims 2, 25), the cathode targets being in substantial vertical registry using a second group of targets is not discussed (Claims 3, 15), the cathode/target assemblies of the first and second groups of cathode/target assemblies located within a single vacuum chamber is not discussed (Claim 4), the cathode/target assemblies of said first and second groups of cathode/target assemblies form an in-line or a circular-shaped arrangement within said vacuum chamber is not discussed (Claim 16), the cathode/target assemblies of said first and second groups of cathode/target assemblies are located in a plurality of vacuum chambers is not discussed (Claims 6, 17), the plurality of vacuum chambers forming an in-line or a circularly-shaped arrangement of chambers is not discussed (Claim 7), and the means for transporting the at least one substrate/workpiece past the first and second groups of cathode/target assemblies for deposition of the first, second pluralities of sub-layers comprises means for mounting and transporting at least one disk-shaped substrate/workpiece is not discussed (Claims 11, 20), forming perpendicular magnetic recording medium is not discussed (Claim 13).

At the outset it should be noted that Akiyama's method applied to one side of the substrate should be applied to other side of the substrate when coating two sides for improved uniformity. (See Akiyama discussed above)

Regarding claims 2, 25, Hedgcoth teach providing targets to coat both sides of a substrate. (See Fig. 1; Column 4 lines 31-35)

Regarding claim 3, Hedgcoth suggest locating target in vertical registry for an in-line apparatus. (See Figs. 1 and 2)

Regarding claim 4, Hedgcoth locating targets 42 in a single vacuum chamber. (See Figs. 1 and 2)

Regarding claim 6, Hedgcoth suggest locating targets 42 and 44 in different vacuum chambers. (See Figs. 1 and 2; Column 4 lines 7-8)

Regarding claim 7, Hedgcoth suggest the plurality of vacuum chamber arranged in-line. (See Figs. 1 and 2)

Regarding claim 11, Hedgcoth suggest means 6 for transporting and mounting at least one disk shaped workpiece. (Column 4 line 4; Fig. 2)

Regarding claim 13, Hedgcoth teach forming perpendicular magnetic recording medium. (Column 4 lines 56-57) It follows that to make a uniform layer one would use the teachings of Akiyama et al. when sputtering depositing layers such as when Hedgcoth sputters the magnetic recording layer.

Regarding claim 15, Hedgcoth suggest locating target in vertical registry. (See Figs. 1 and 2) Hedgcoth teach forming coatings on each of the first and second surface simultaneously. (See Figs. 1, 2)

Regarding claim 16, Hedgcoth suggest an in-line arrangement. (See Figs. 1 and 2)

Regarding claim 17, Hedgcoth suggest the plurality of vacuum chambers arranged in-line. (See Figs. 1 and 2)

Regarding claim 18, Hedgcoth suggest that the targets should be magnetron targets. (Column 4 lines 33-35; Column 4 lines 52-55)

Regarding claim 20, Hedgcoth suggest means 6 for transporting and mounting at least one disk shaped workpiece. (Column 4 line 4; Fig. 2)

The motivation for utilizing the features of Hedgcoth is that it allows for producing magnetic disks. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Akiyama et al. by utilizing the features of Hedgcoth because it allows for producing magnetic disks.

Claims 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al. (Evidence Document to Brors) in view of Hedgcoth as applied to claims 2-4, 6, 7, 11, 15-17, 20 and 25 above, and further in view of Mukai et al. (U.S. Pat. 5,441,615).

The difference not yet discussed is the use of shield members. (Claims 12, 21)

Regarding claims 12, 21, Mukai et al. teach utilizing deposition shield members for targets. (Column 3 lines 30-32)

The motivation for utilizing the features of Mukai et al. is that it allows for preventing sputtered particles from dispersing to the outside of the deposition shield members. (Column 2 lines 61-65)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Mukai et al. because it

allows for preventing sputtered particles from dispersing to the outside of the deposition shield members.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akiyama et al. (Evidence Document to Brors) in view of Hedgcoth as applied to claims 2-4, 6, 7, 11, 15-17, 20 and 25 above, and further in view of Nasu et al. (U.S. Pat. 5,326,637).

The difference not yet discussed is depositing a perpendicular magnetic recording medium on a magnetically soft underlayer and the magnetic soft underlayer being 500 to 4,000 Angstroms and being Fe or Fe-Co (claim 23).

Regarding claim 23, Nasu et al. teach depositing a magnetic recording medium by sputtering on a magnetically soft underlayer. (See Abstract) The magnetic soft underlayer can be Fe, Fe-Co. (See Abstract). The thickness can be 500 Angstroms. (Column 5 lines 28-35)

The motivation for utilizing the features of Nasu et al. is that it allows for producing a film with high recording density and reproduction output. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Nasu et al. because it allows for producing a film with high recording density and reproduction output.

Response to Arguments

Applicant's arguments filed December 22, 2009 have been fully considered.

In response to the argument that Akiyama fails to teach different sputtered film thickness profiles, such that the first plurality of sub-layers collectively form the said uniform thickness layer of said selected material, and wherein the first plurality of sub-

layers have an inner diameter thickness that is different from an outer diameter thickness, it is argued that Akiyama teach sputtering different sublayers with different diameter magnets in order that the sum total of those layers produce a uniform layer in totality. Each sublayer differs from one another in uniformity in order to produce a layer where the sum total of the non uniform sublayers produce a uniform layer. Since the magnetrons in Akiyama are of different sizes (i.e. diameters) the same as Applicants magnetrons the inner and outer diameter thickness of each sublayer will differ. (See Akiyama discussed above) Furthermore Nagano teach producing sublayers where the center thickness distribution of one sublayer is different than the center thickness of the next deposited sublayer. Nagano subalyers in total produce a uniform layer. (See Nagano discussed above)

In response to the argument that Akiyama et al. fails to teach deposition of the sub-layers resulting in the uniform thickness layer on the at least one substrate/workpiece, and the sub-layers have an inner diameter thickness that is different from an outer diameter thickness, it is argued that Akiyama teach sputtering different sublayers with different diameter magnets in order that the sum total of those layers produce a uniform layer in totality. Each sublayer differs from one another in uniformity in order to produce a layer where the sum total of the non uniform sublayers produce a uniform layer. Since the magnetrons in Akiyama are of different sizes (i.e. diameters) the same as Applicants magnetrons the inner and outer diameter thickness of each sublayer will differ. (See Akiyama discussed above) Furthermore Nagano teach producing sublayers where the center thickness distribution of one sublayer is

different than the center thickness of the next deposited sublayer. Nagano subalyers in total produce a uniform layer. (See Nagano discussed above)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1795

Rodney G. McDonald
Primary Examiner
Art Unit 1795

RM
Jan. 06, 2010